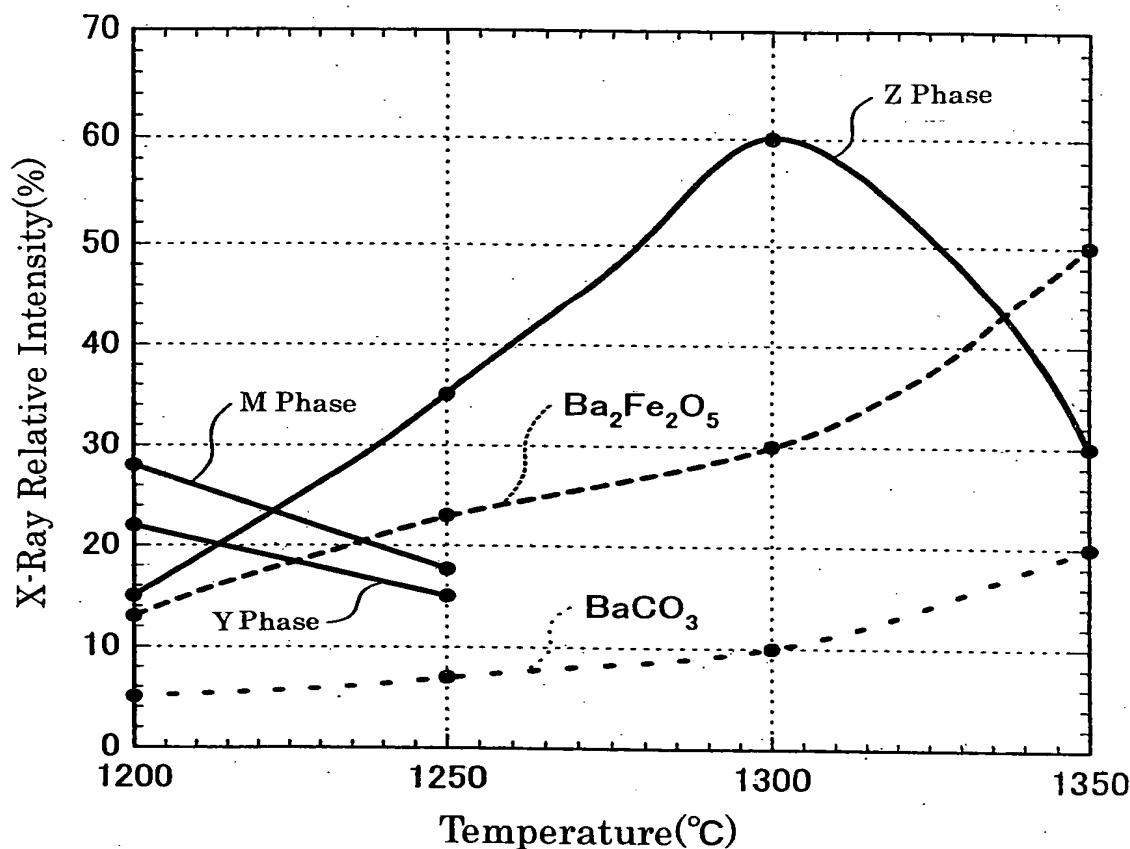


10/009075

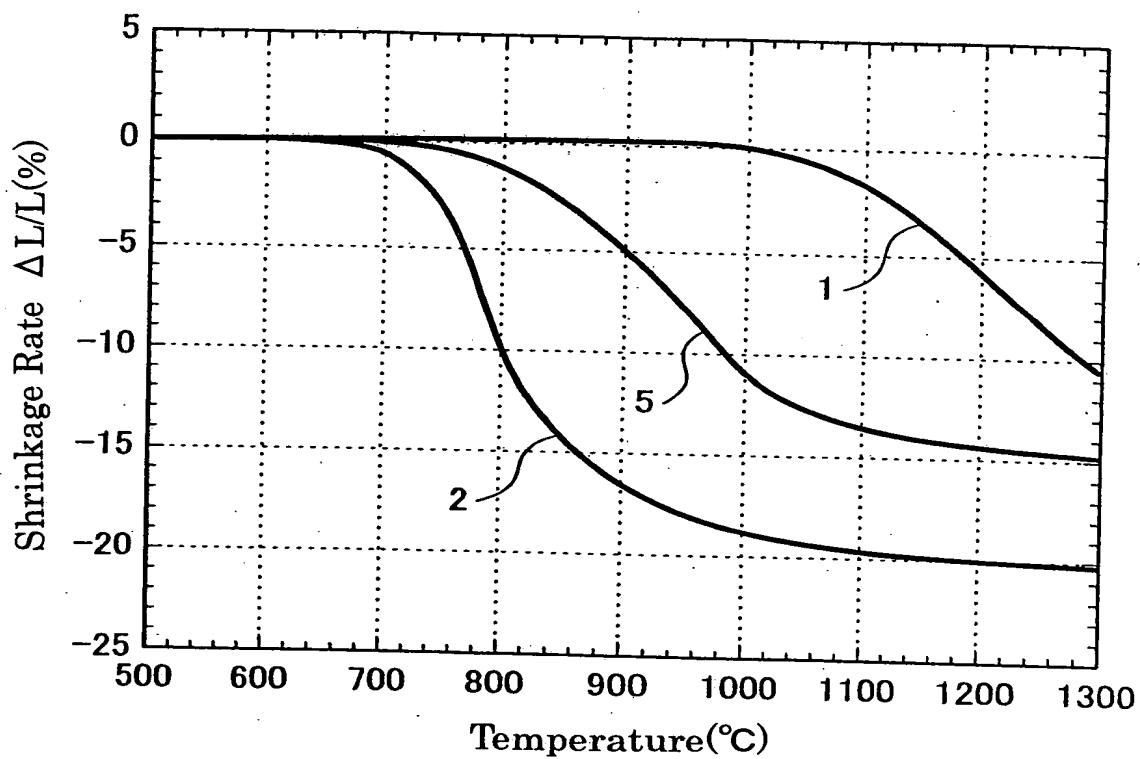
1/45

FIG. 1



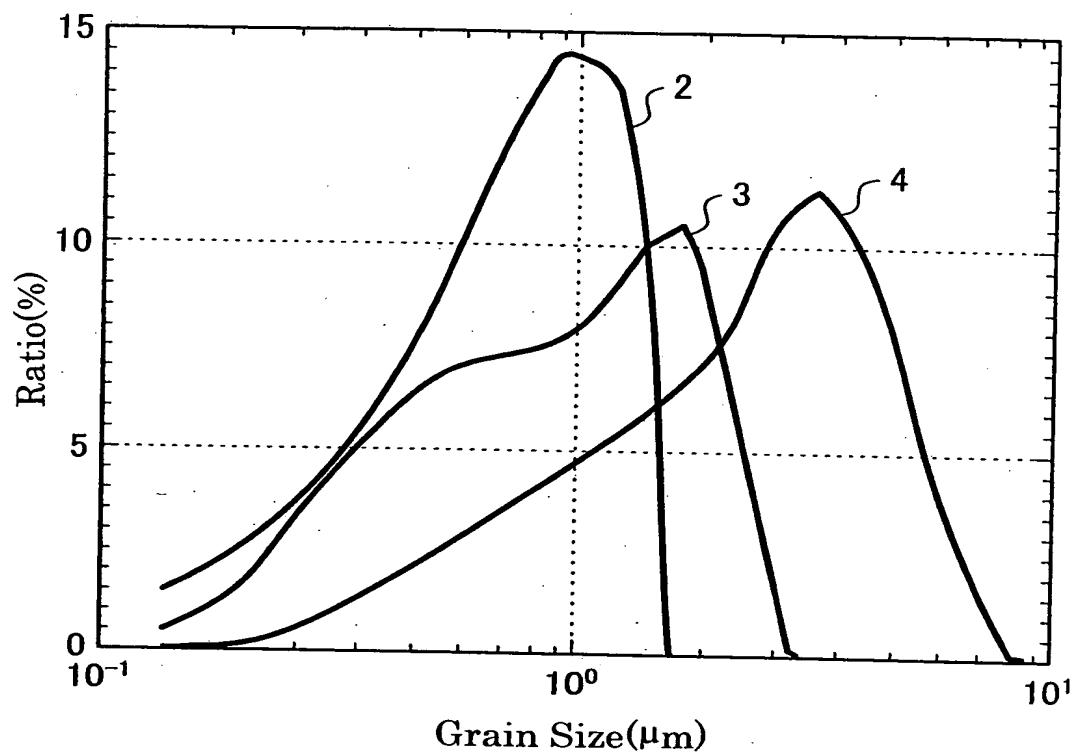
2/45

FIG. 2



3/45

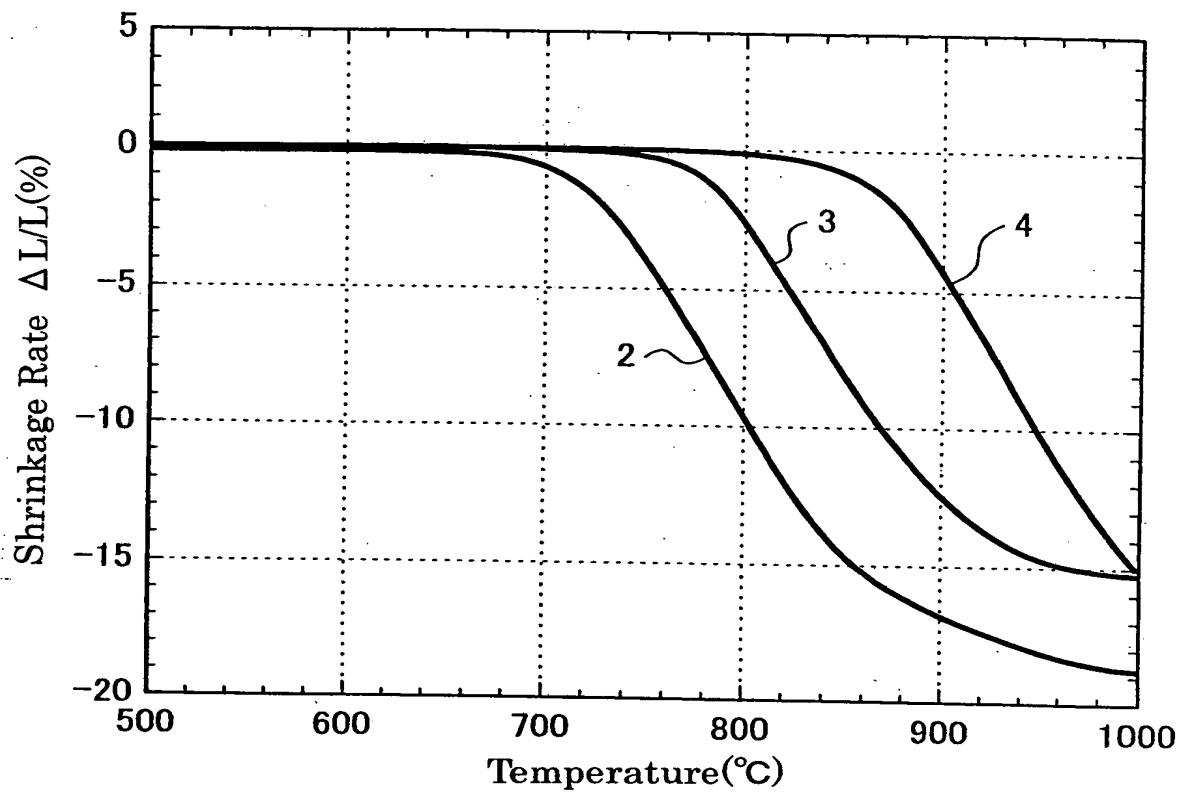
FIG. 3



10/009075

4/45

FIG. 4



10/009075

5/45

FIG. 5

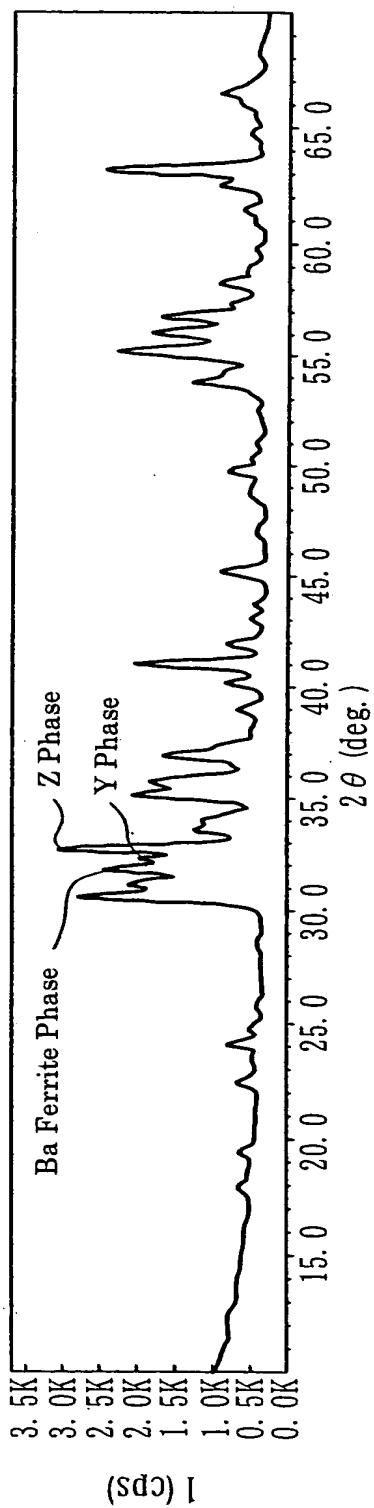
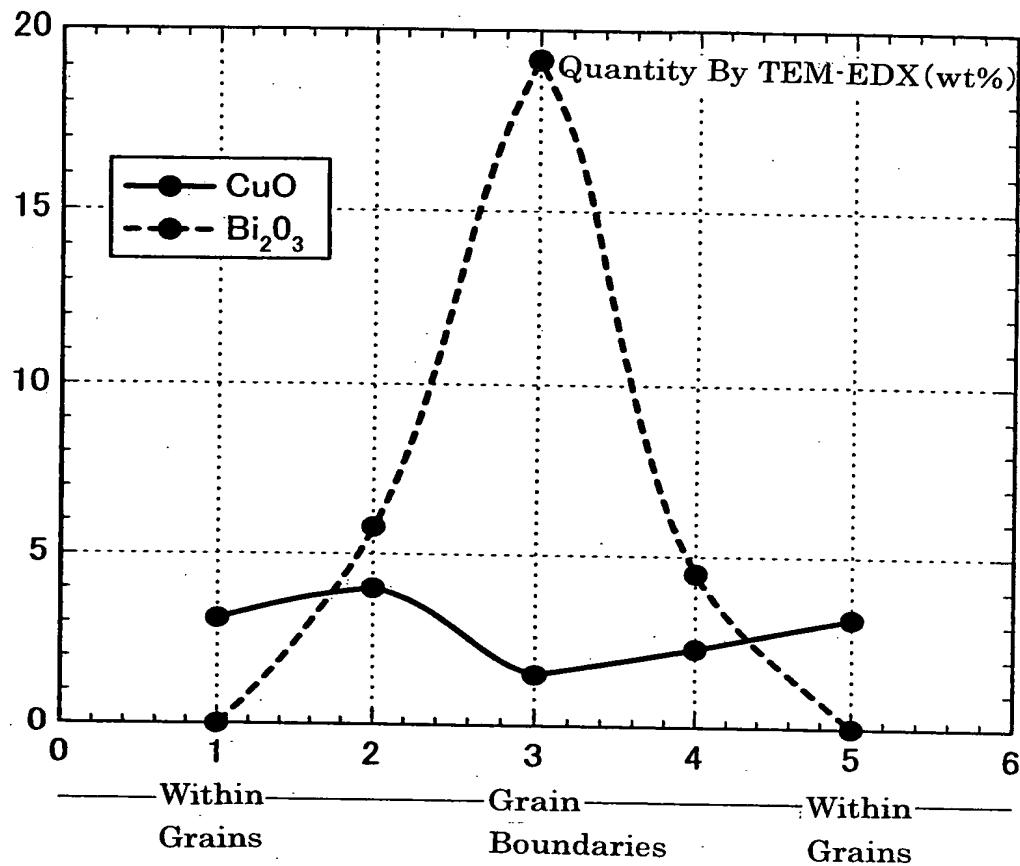
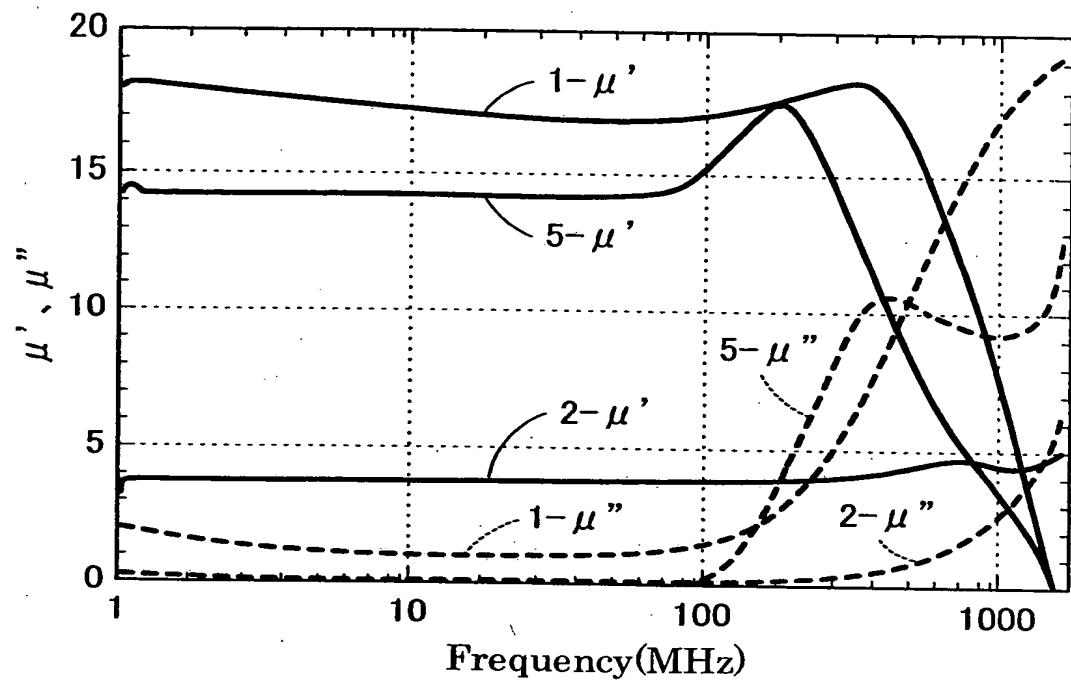


FIG. 6



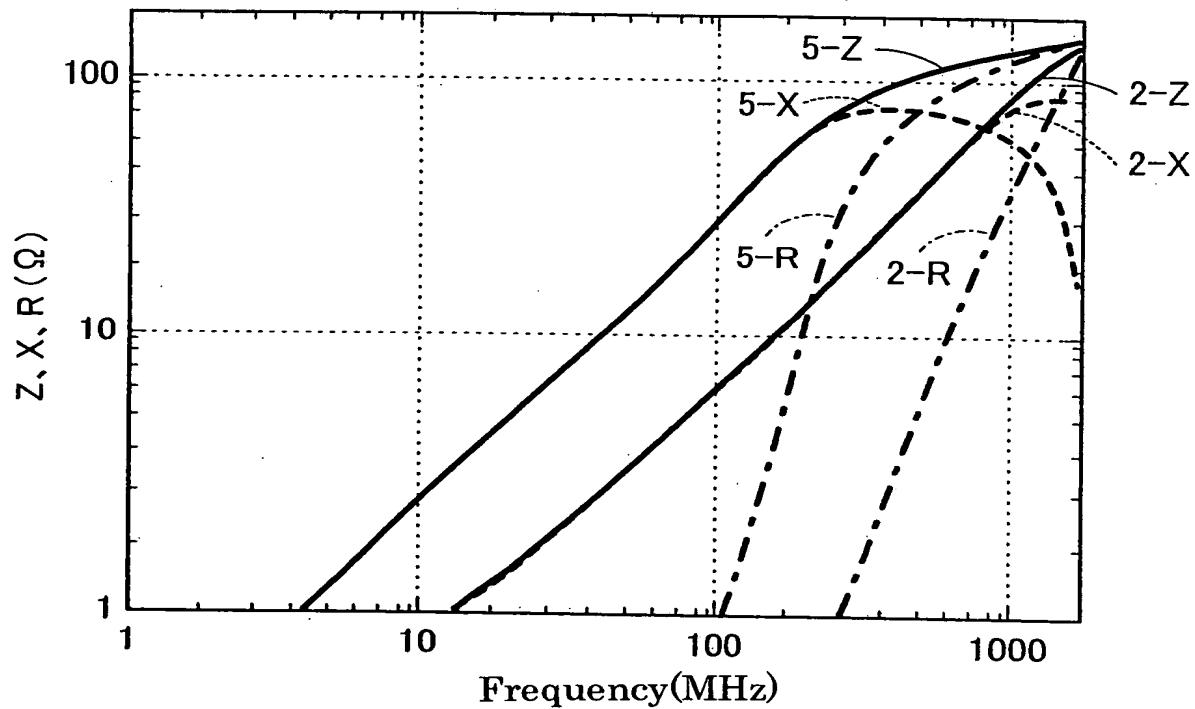
7/45

FIG. 7



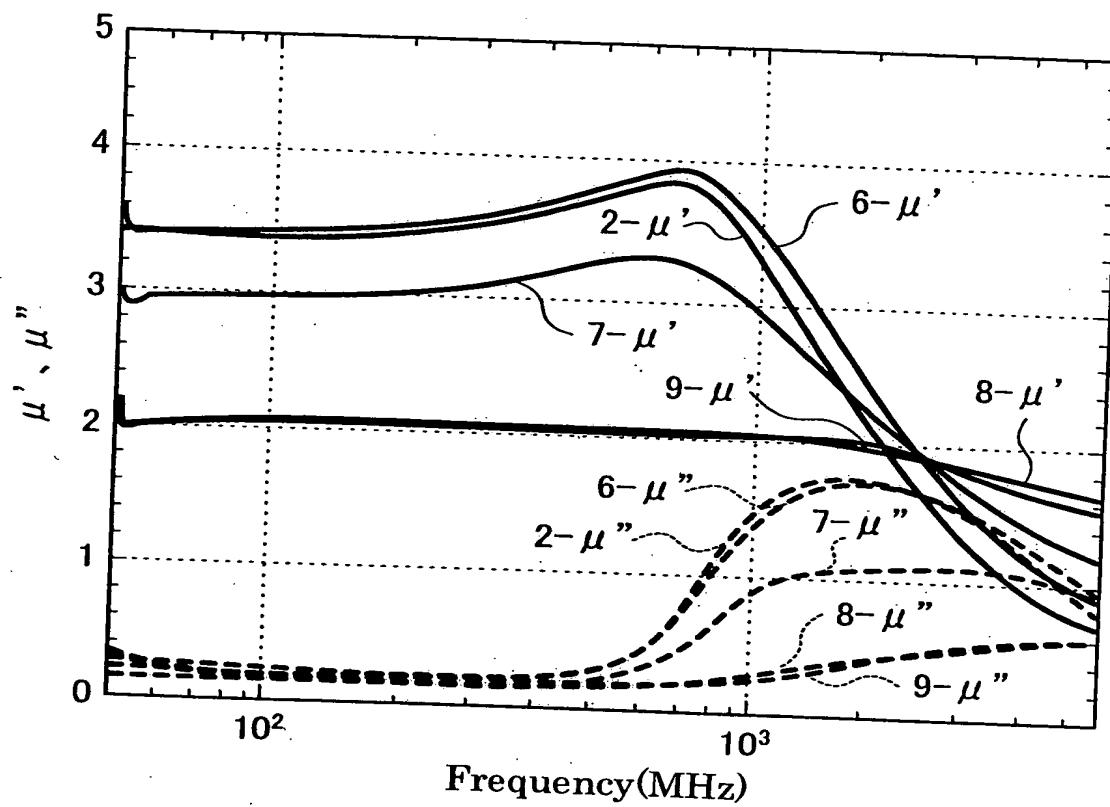
8/45

FIG. 8



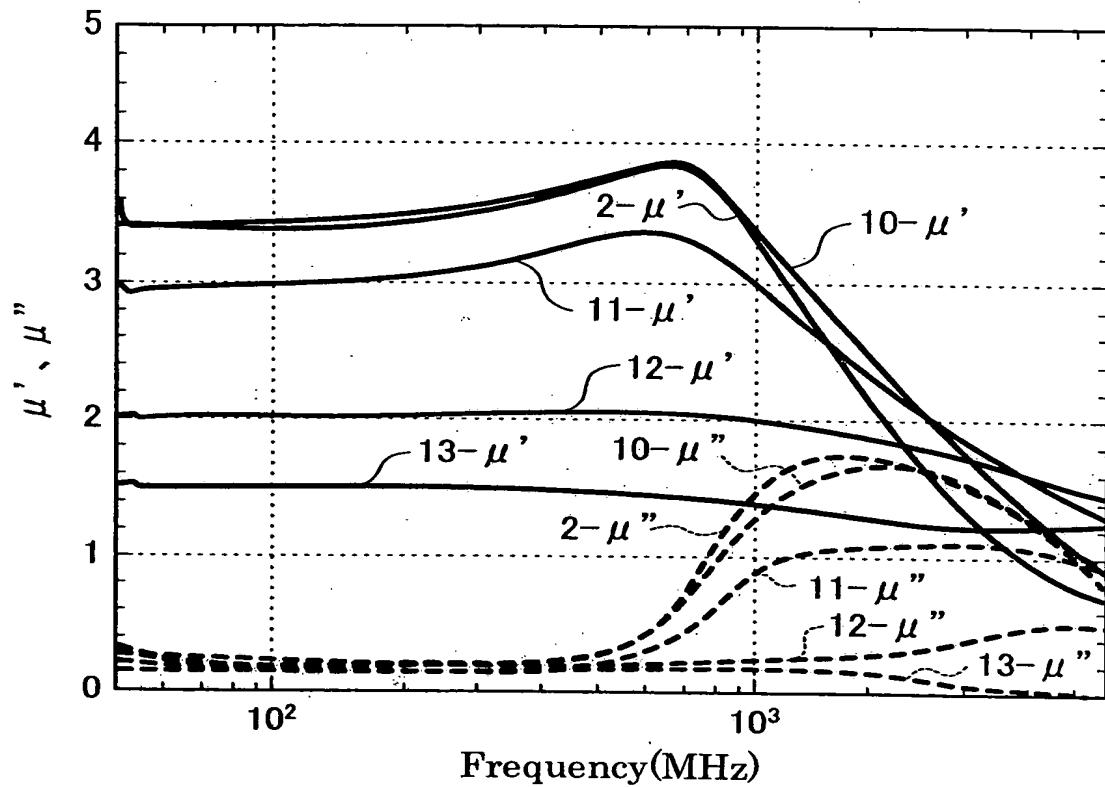
9/45

FIG. 9



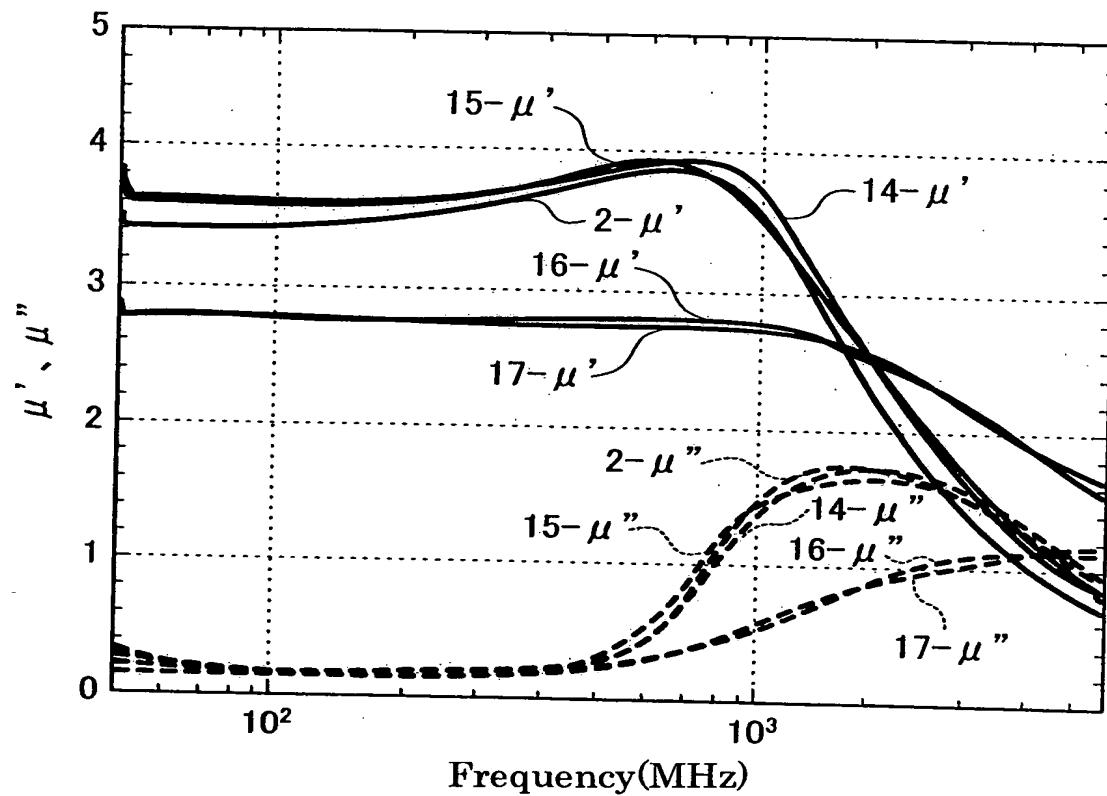
10/45

FIG. 10



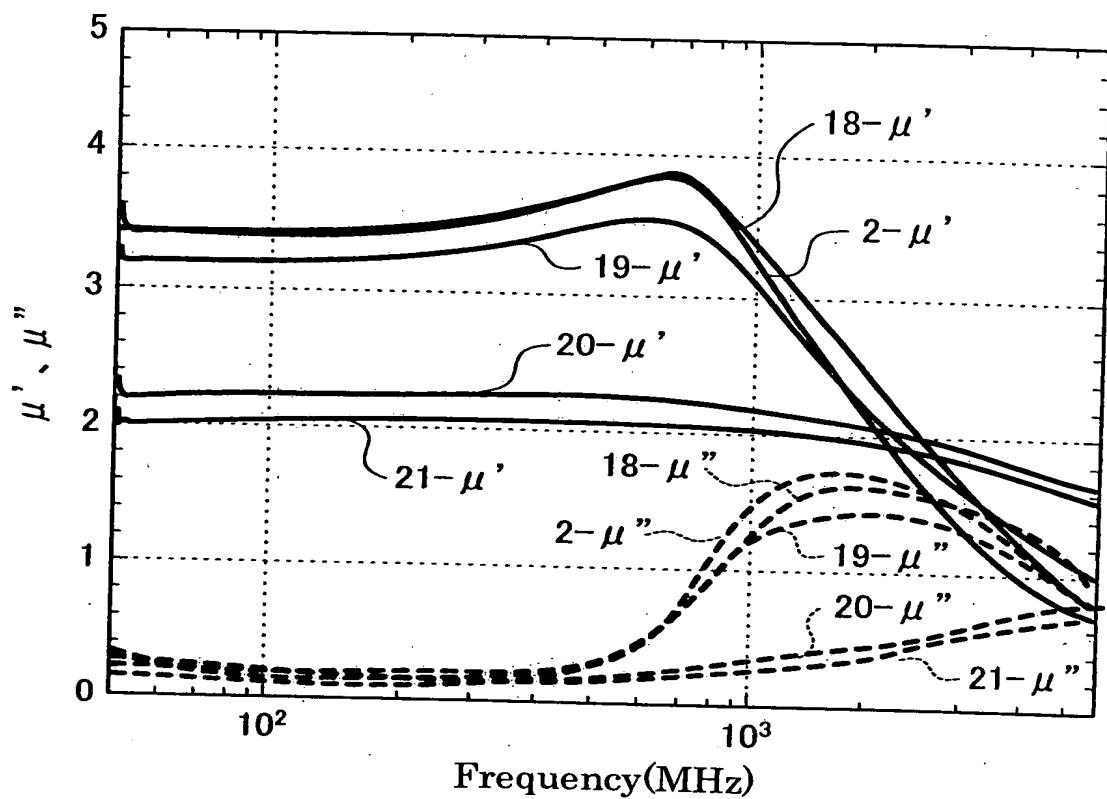
11/45

FIG. 11



12/45

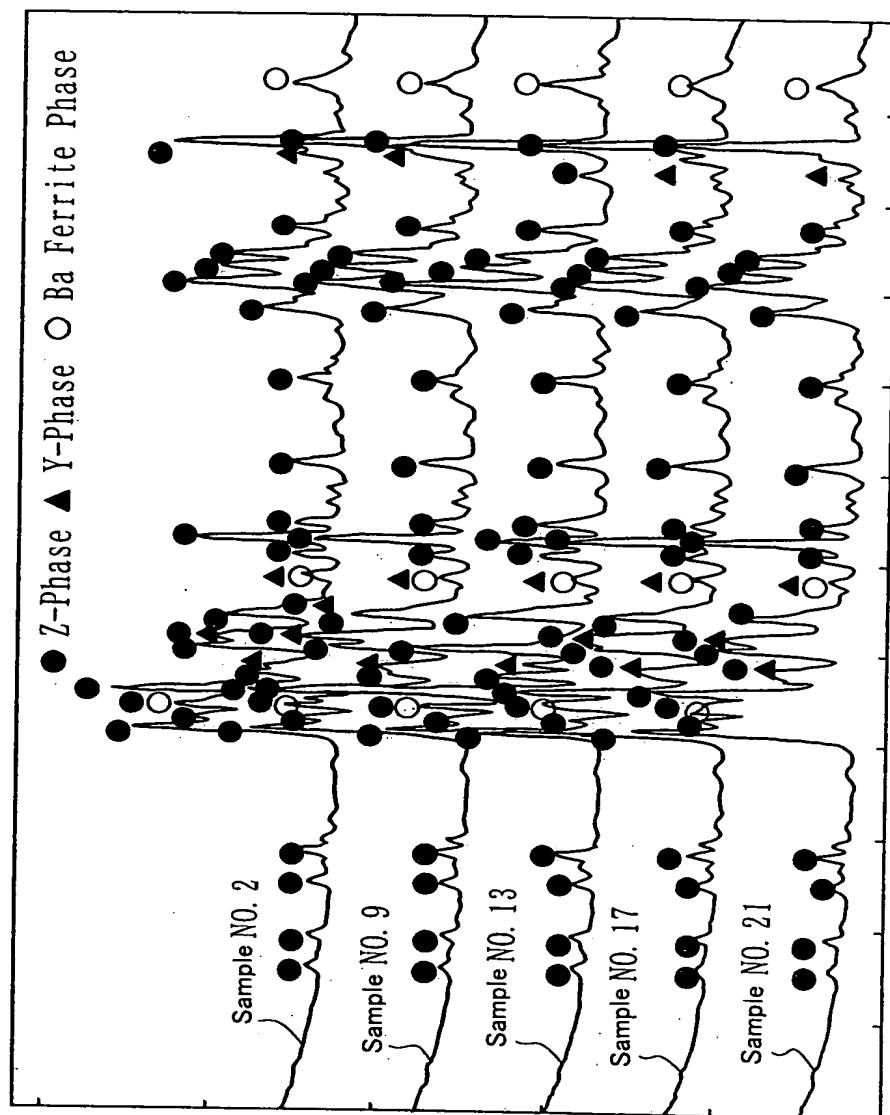
FIG. 12



10/009075

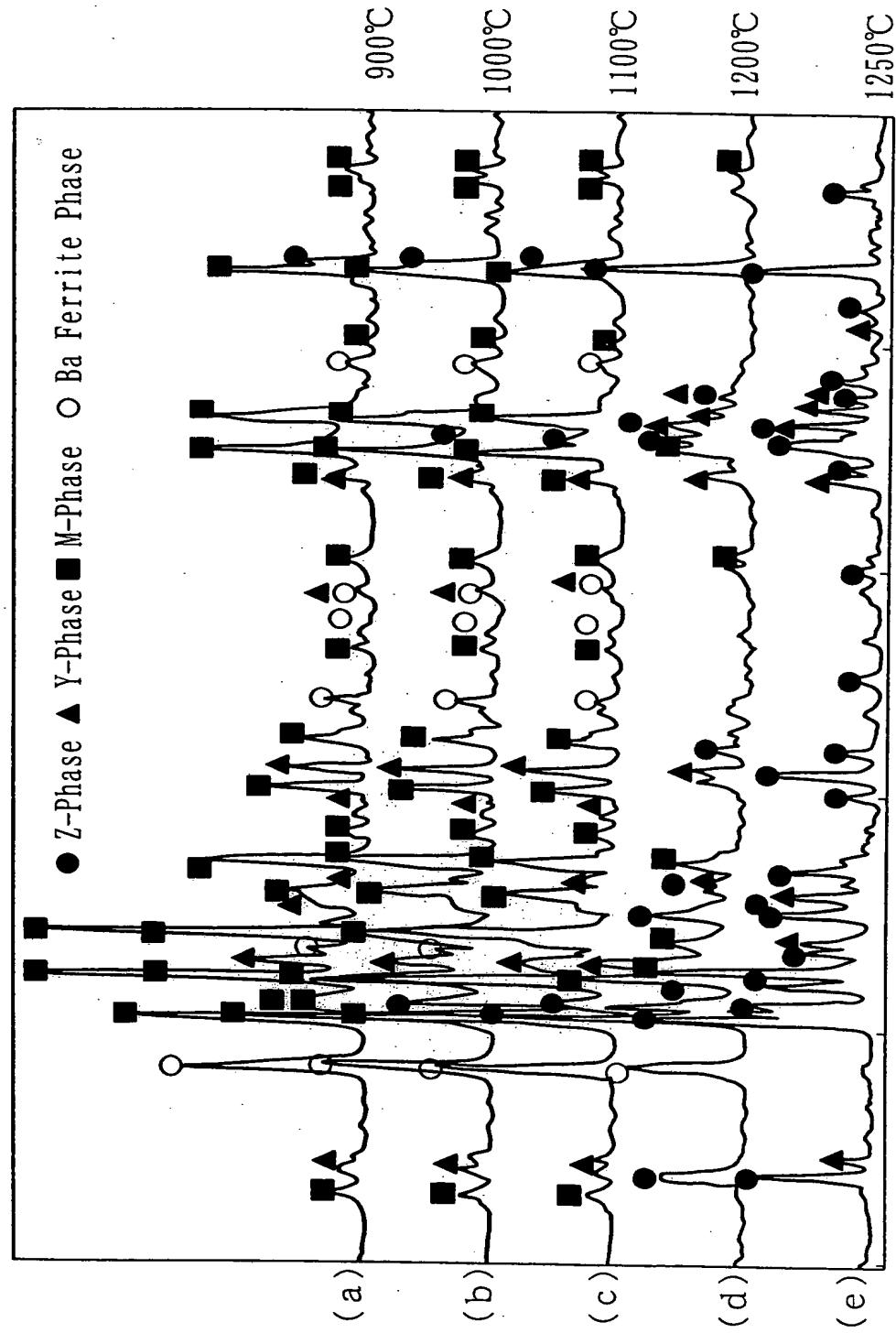
13/45

FIG. 13



14/45

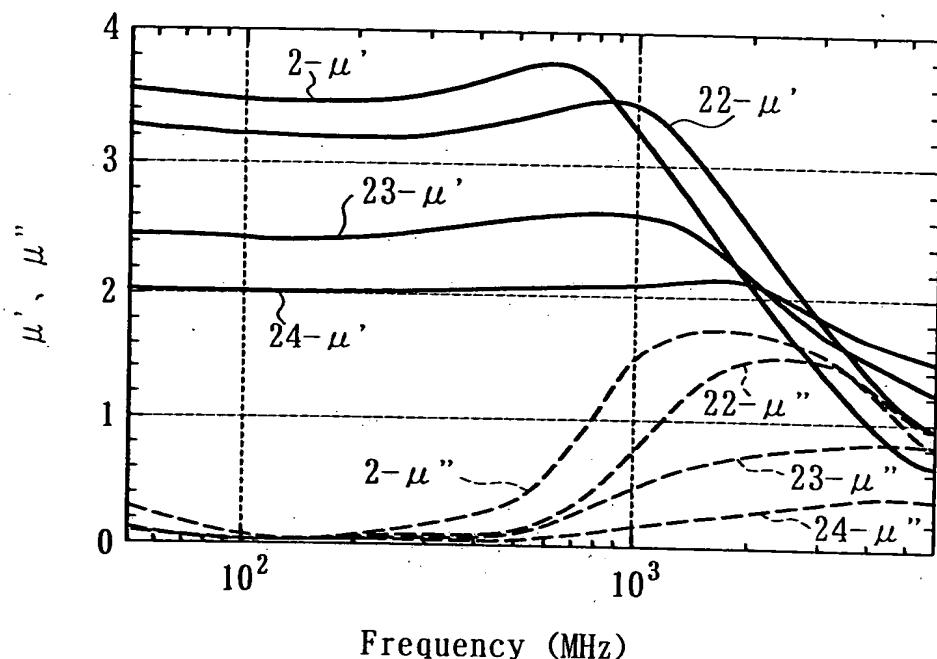
FIG. 14



10/009075

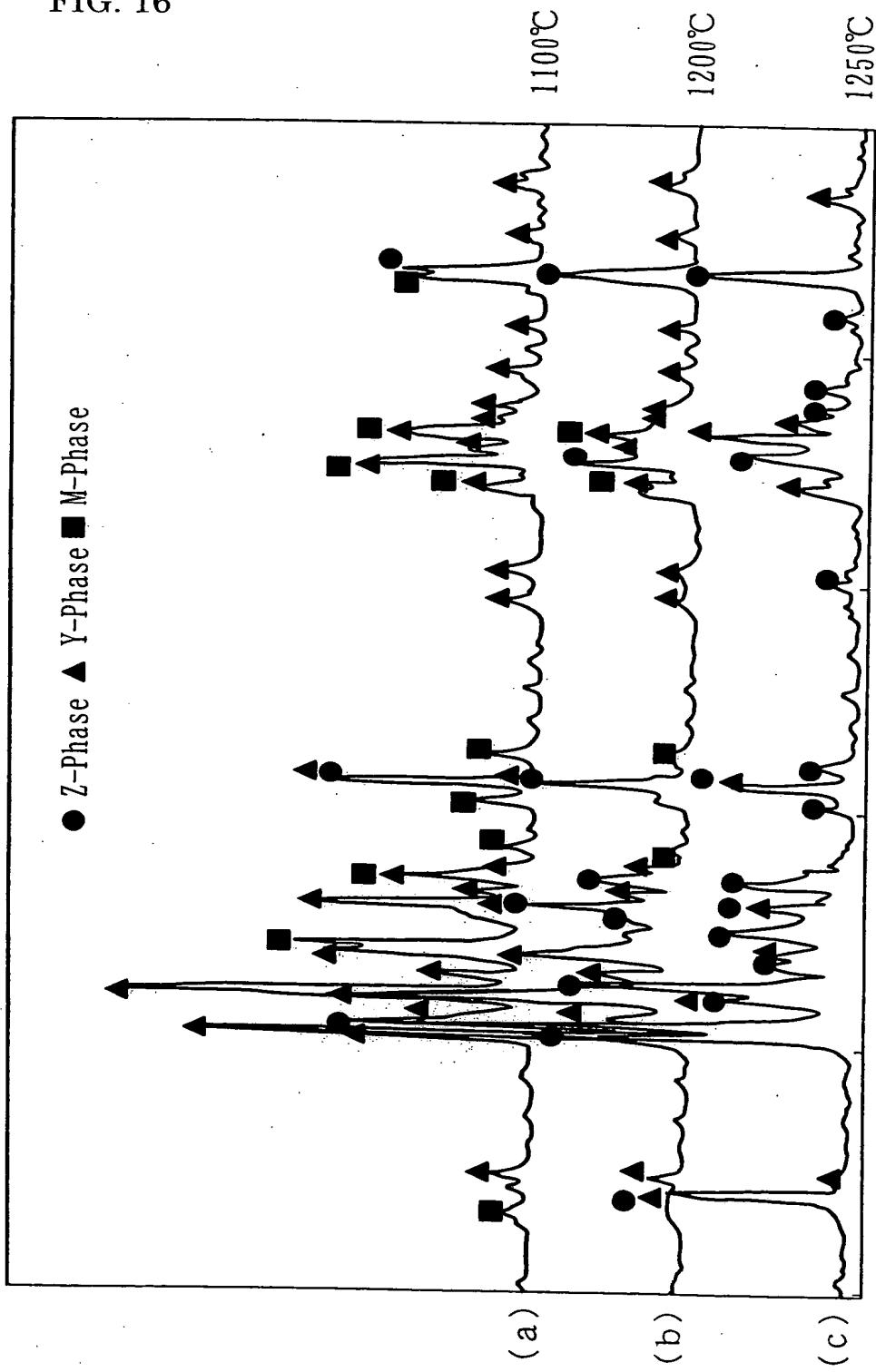
15/45

FIG. 15



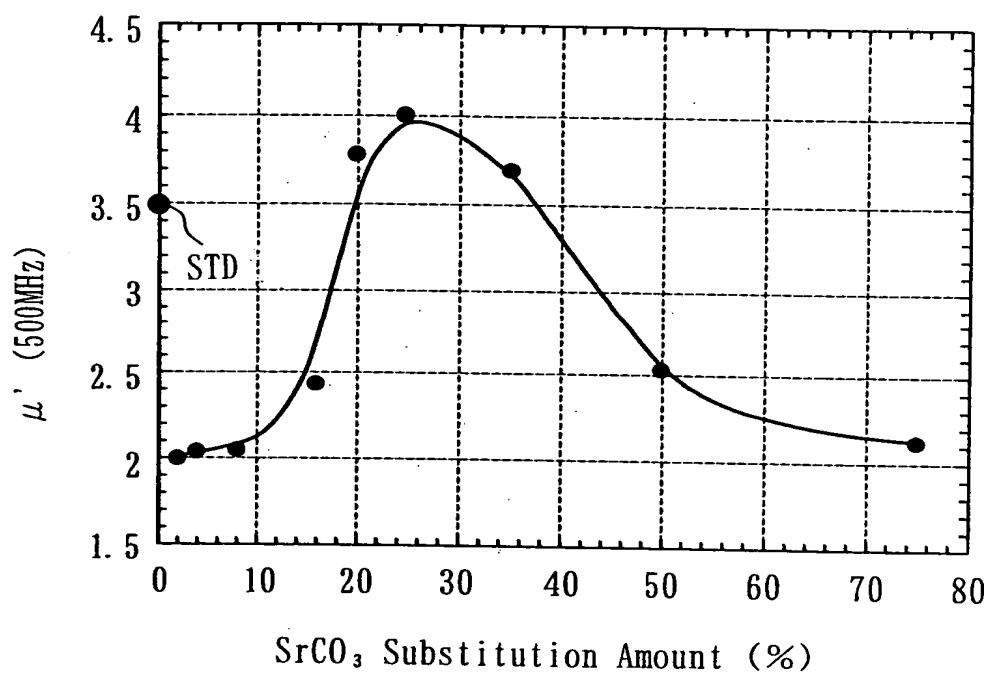
16/45

FIG. 16



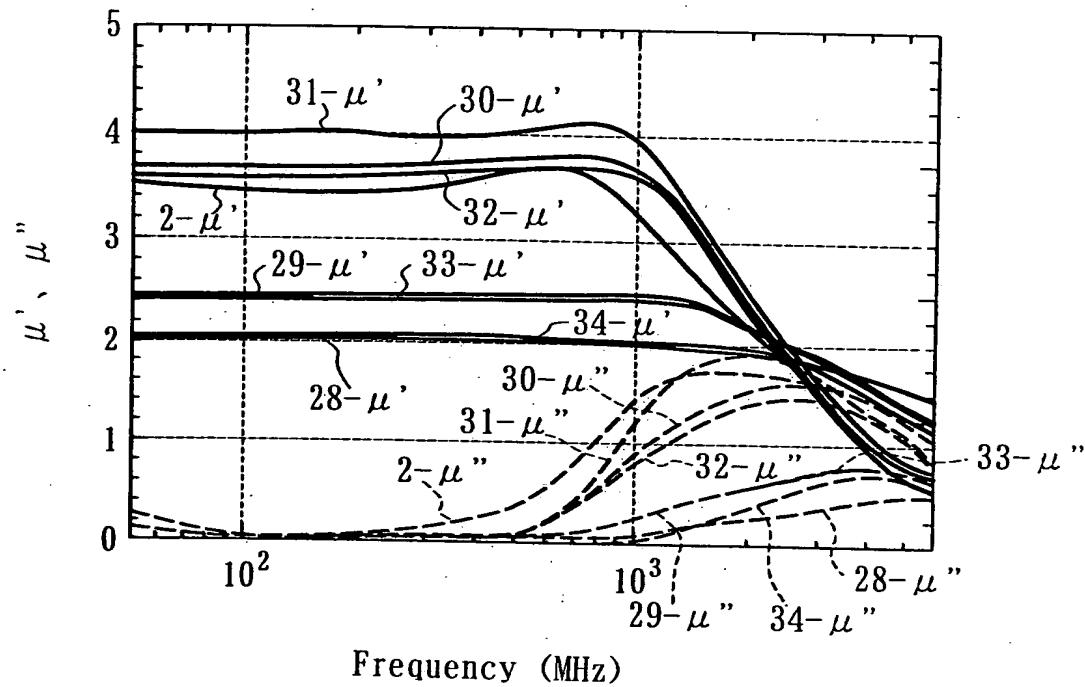
17/45

FIG. 17



18/45

FIG. 18



19/45

FIG. 19

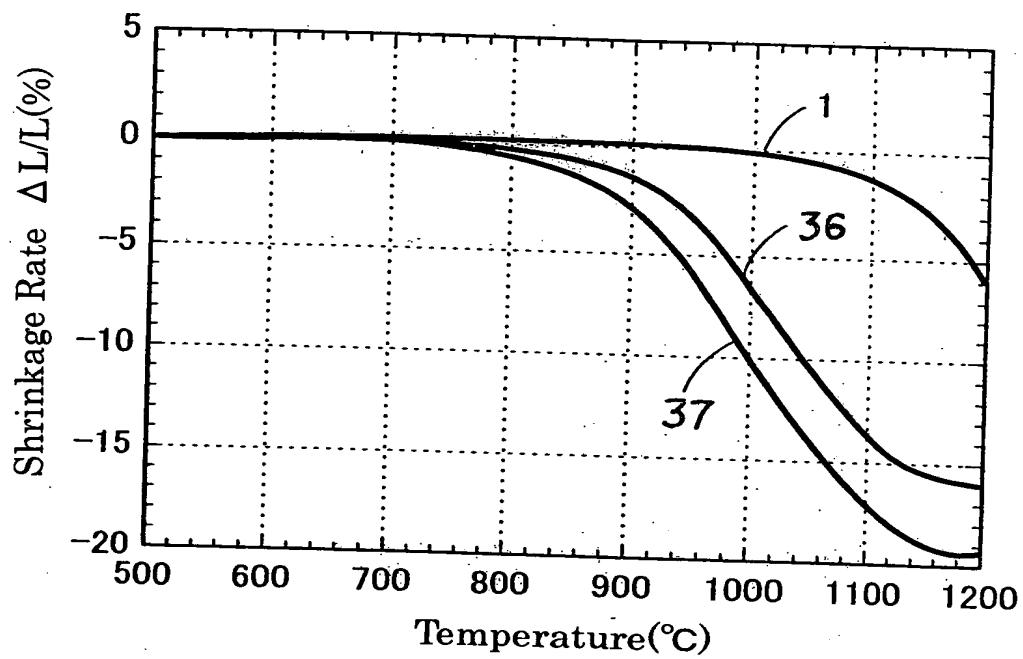
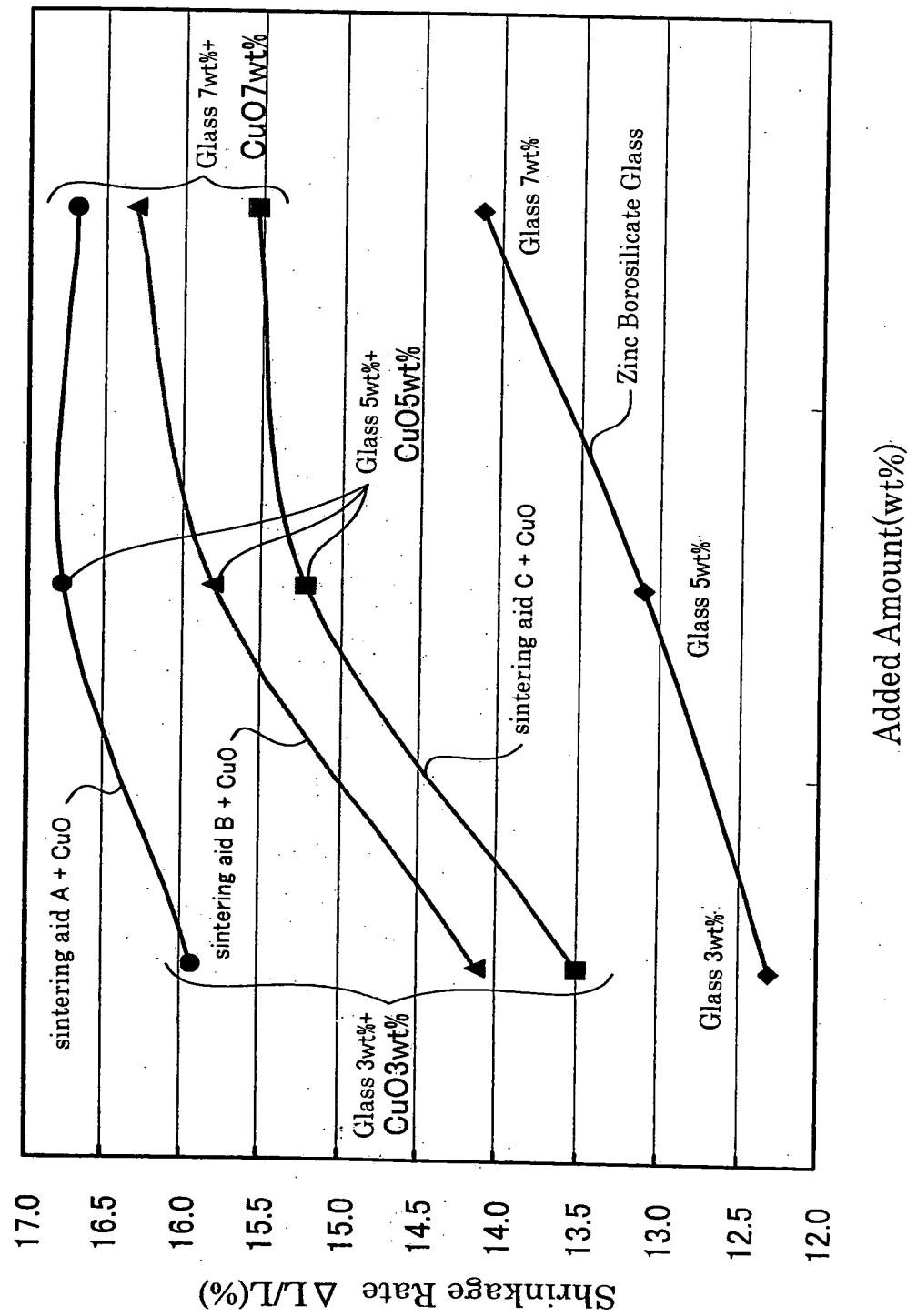
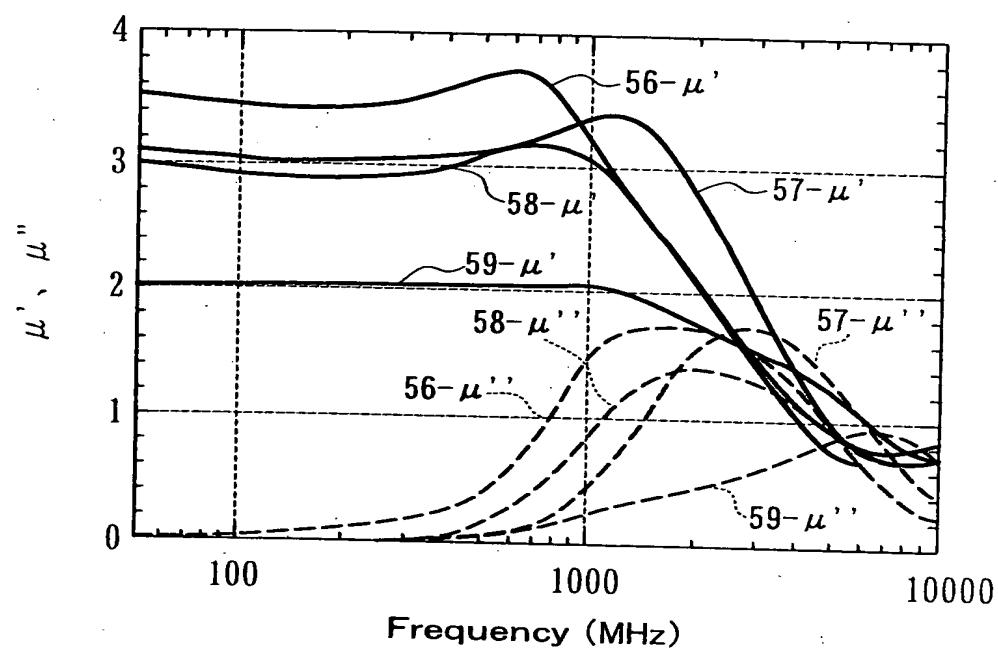


FIG. 20



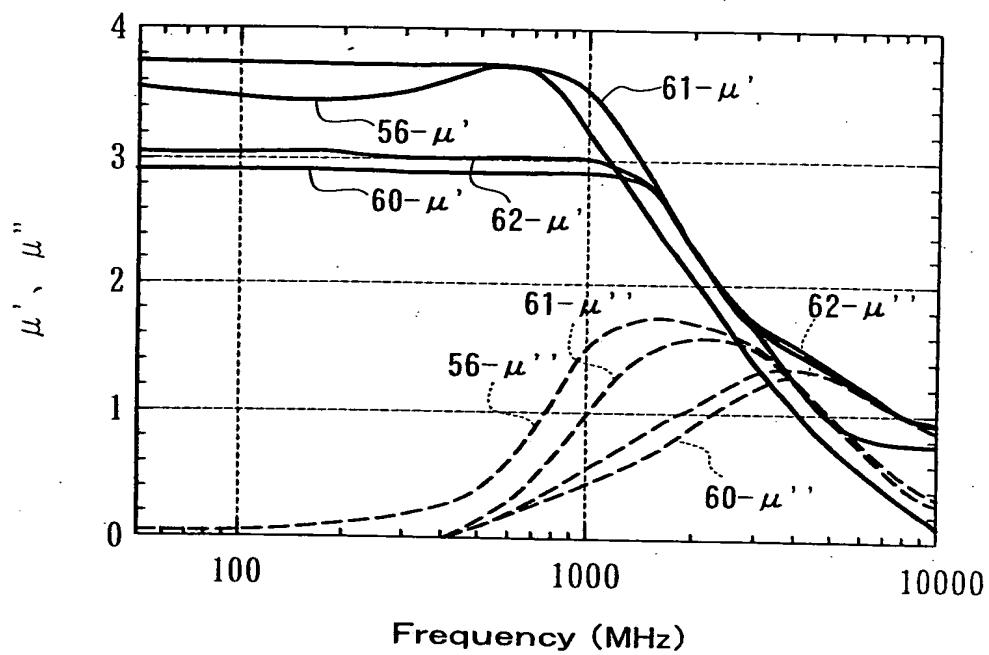
21/45

FIG. 21



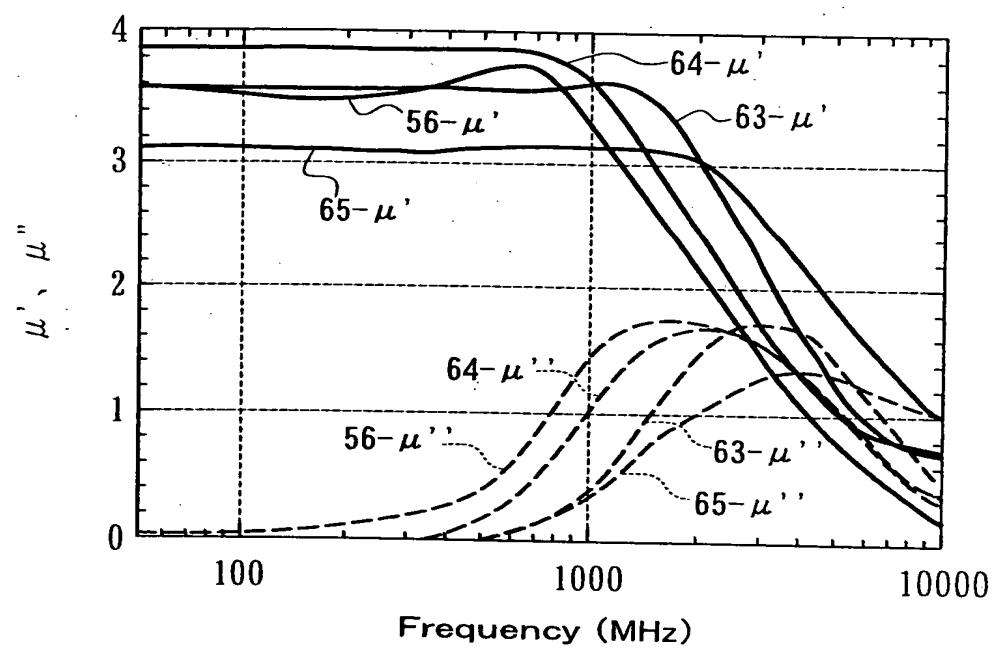
22/45

FIG. 22



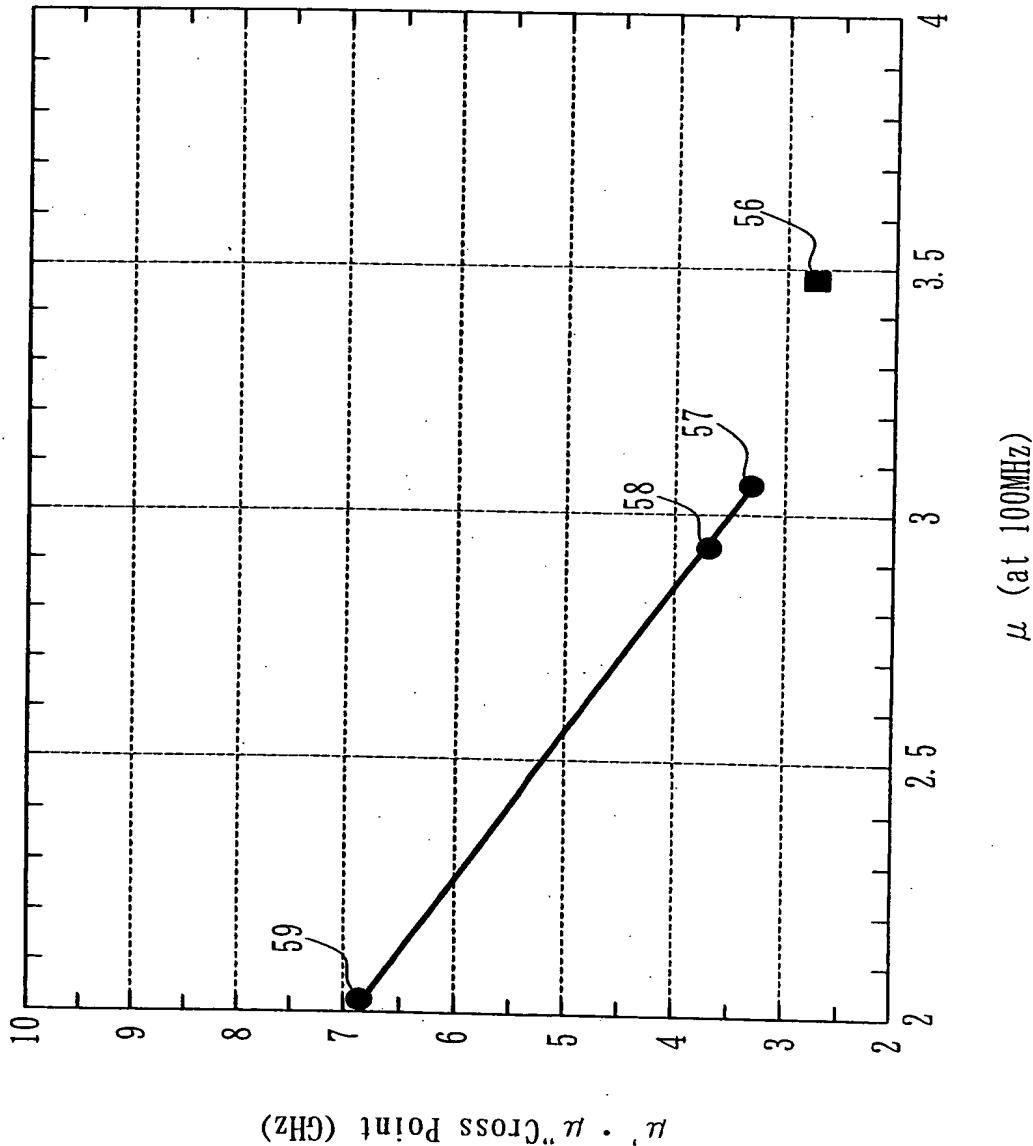
23/45

FIG. 23



24/45

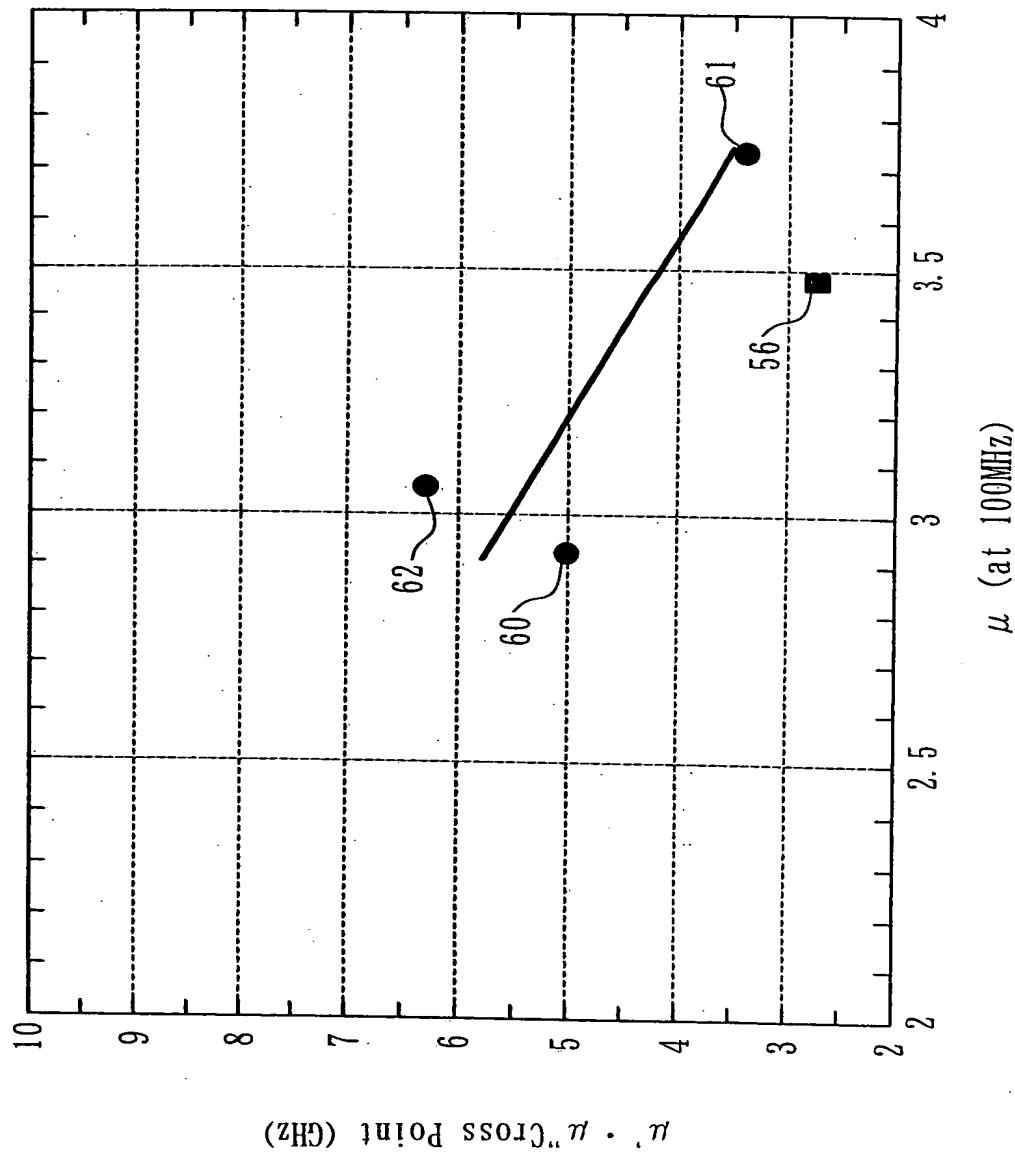
FIG. 24



10/009075

25/45

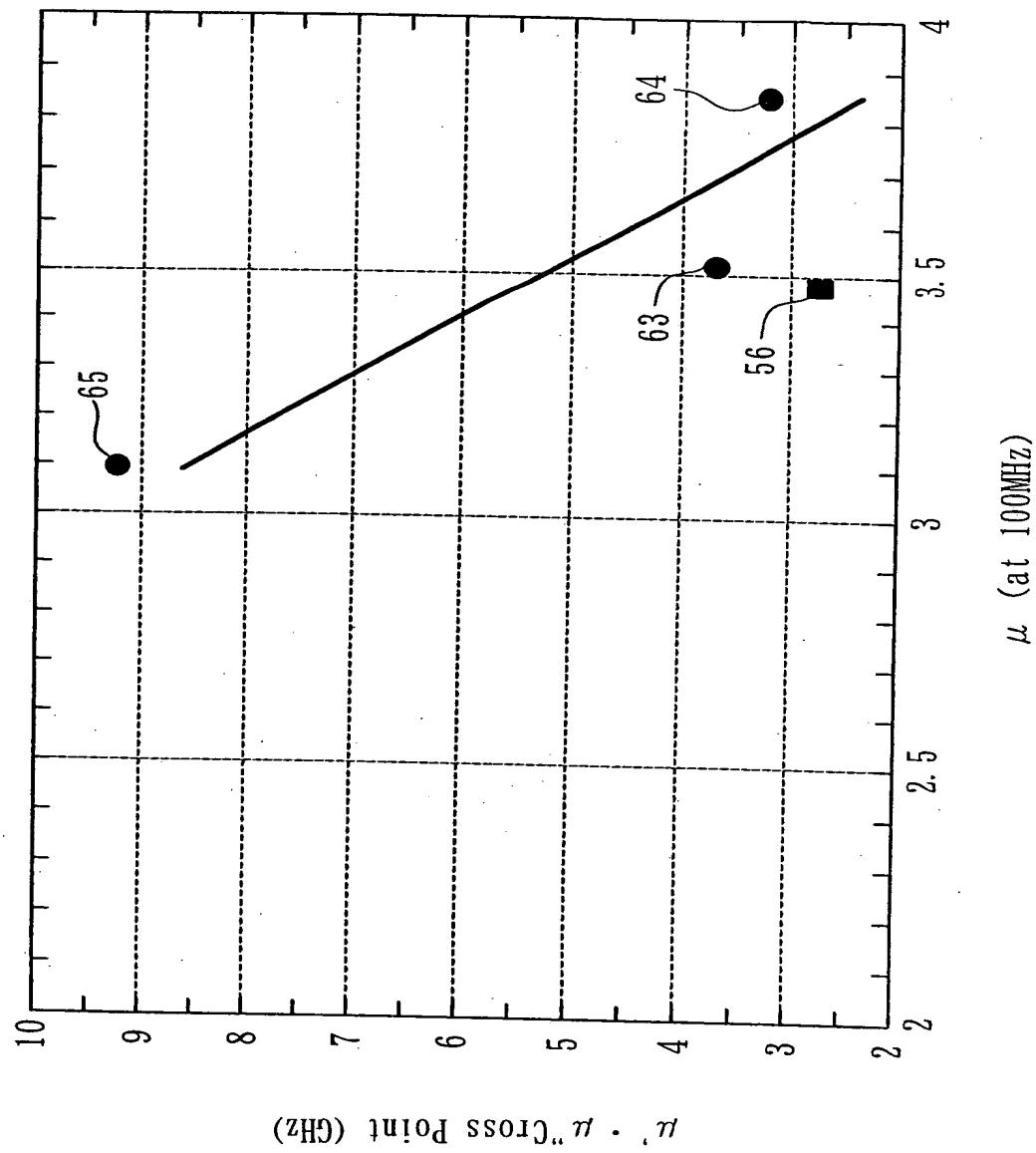
FIG. 25



10/009075

26/45

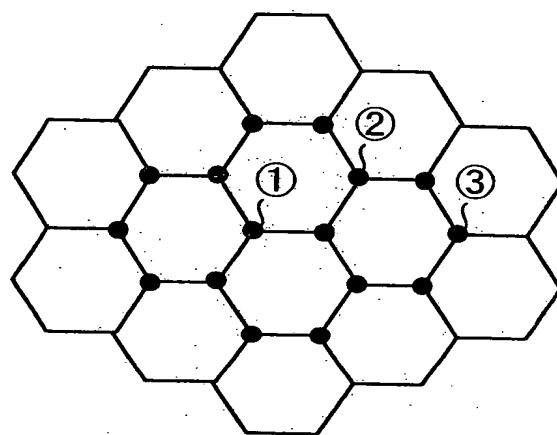
FIG. 26



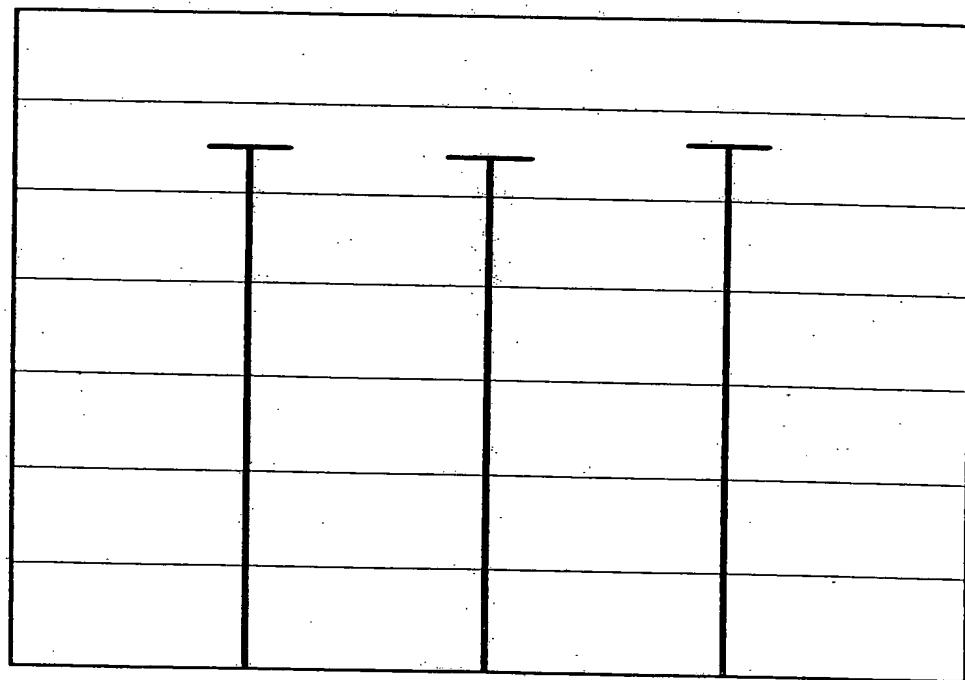
27/45

FIG. 27

(a)



(b)



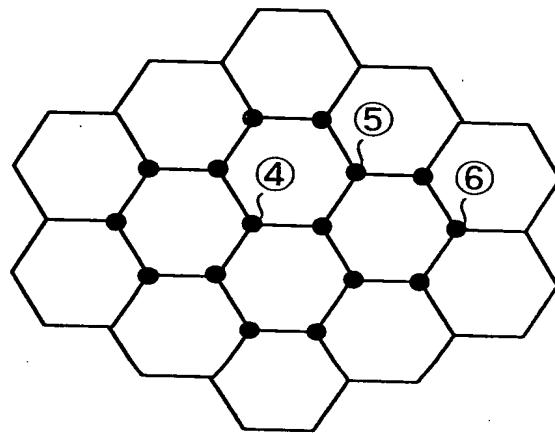
(1)

(2)

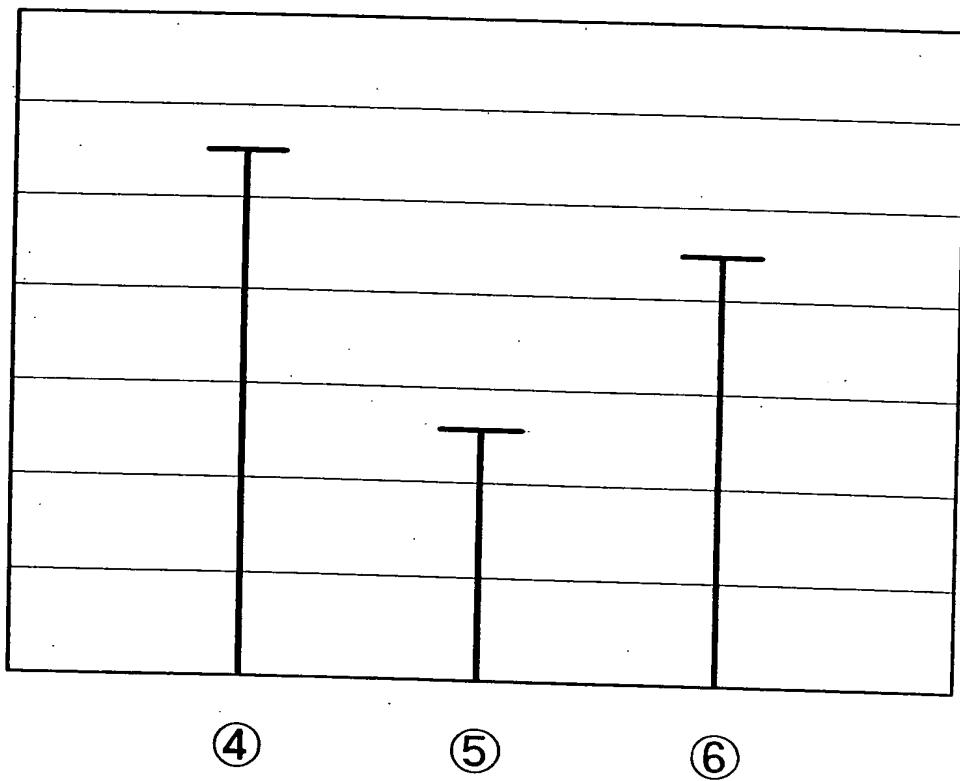
(3)

FIG. 28

(a)



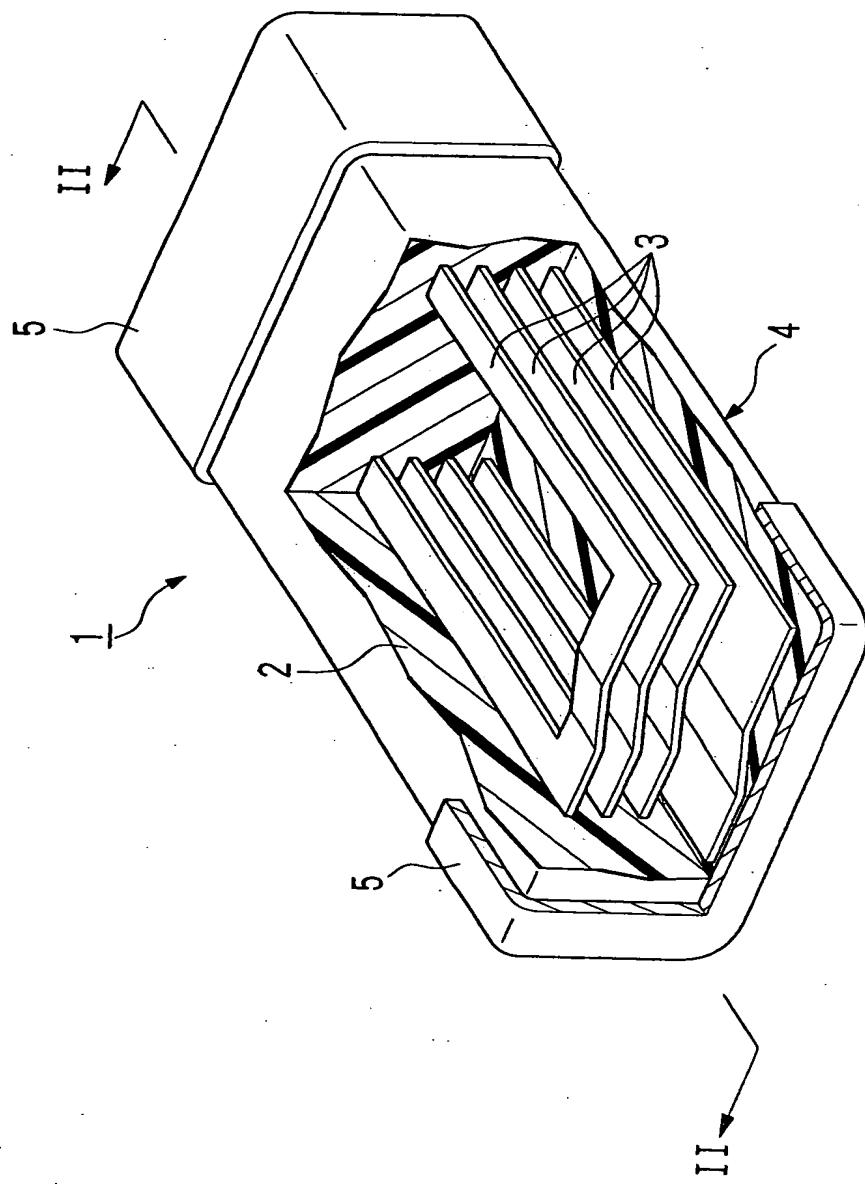
(b)



10/009075

29/45

FIG. 29



30/45

FIG. 30

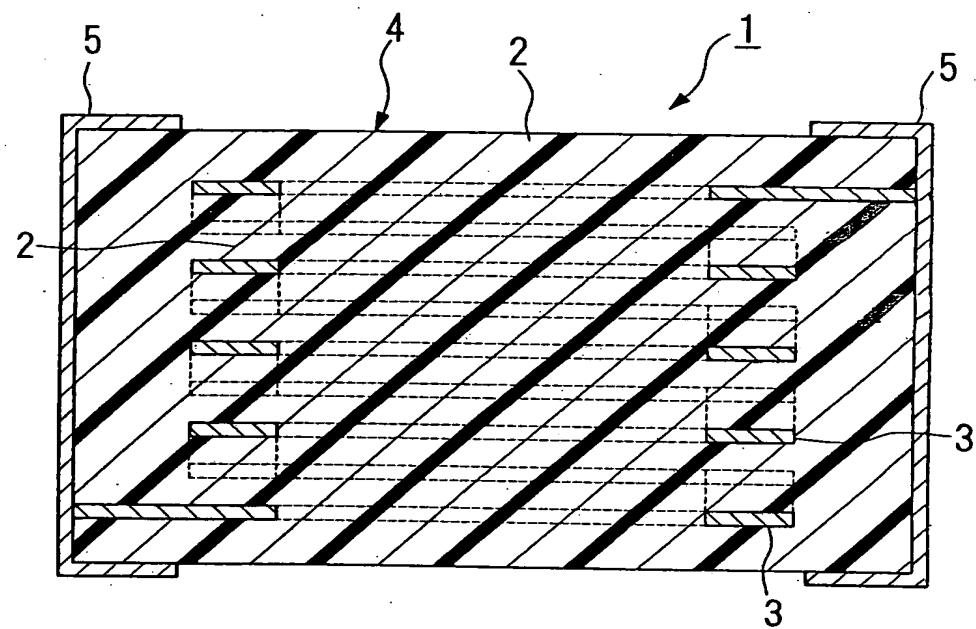
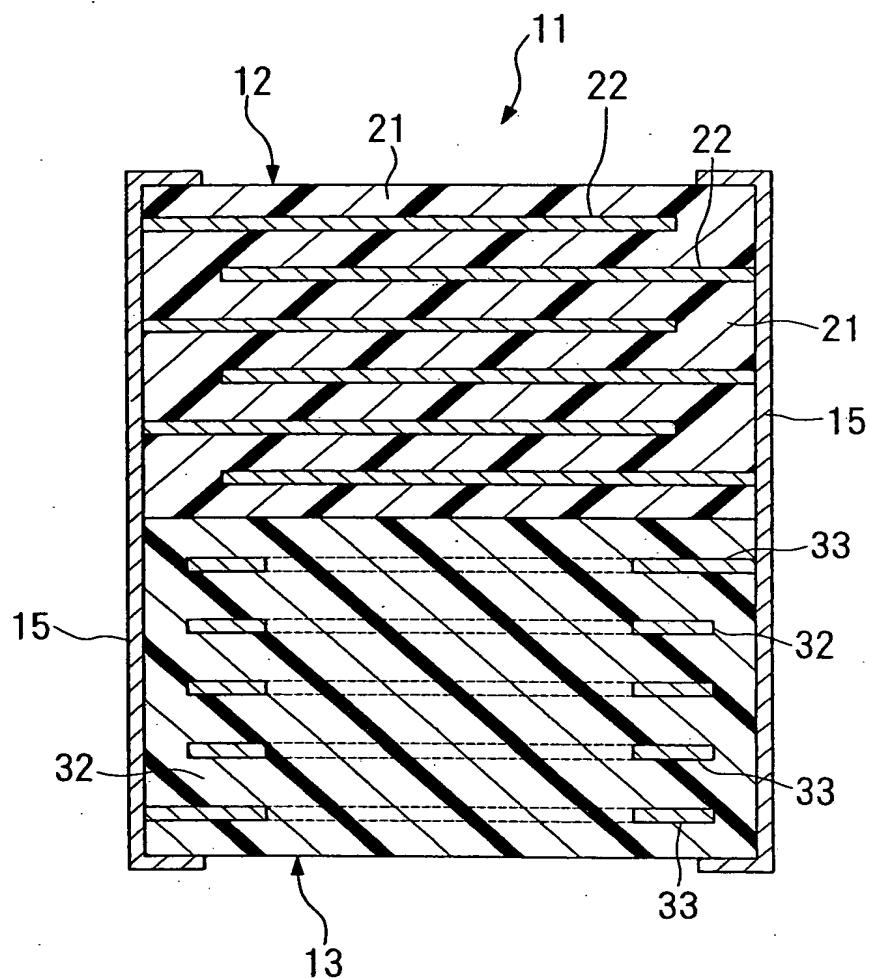


FIG. 31



32/45

FIG.32

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	CuO (wt%)	Bi ₂ O ₃ (wt%)	Peak Value Of Grain Size Distribution	Note
1	68.7	21.035	10.265	—	—	—	Hexagonal Ferrite
2	68.7	21.035	10.265	5.00	5.00	1.0 μ m	Hexagonal Ferrite
3	68.7	21.035	10.265	5.00	5.00	1.65 μ m	Hexagonal Ferrite
4	68.7	21.035	10.265	5.00	5.00	3.3 μ m	Hexagonal Ferrite

FIG.33

Sample No.	Fe ₂ O ₃ (mol%)	NiO (mol%)	CuO (mol%)	ZnO (mol%)	CoO (wt%)	Note
5	48.6	44.9	5.10	1.4	0.2	NiCuZn Ferrite

FIG.34

(m²/g)

Raw Material Powder	Specific Surface Area
Fe ₂ O ₃	5.5
BaCO ₃	10.6
Co ₃ O ₄	12
CuO	6.7
NiO	5
MnO	19
ZnO	5.2
MgO	9.8

33/45

FIG.35

Specific Surface Area (m ² /g)	μ (100MHz)	Sintered Body Density (g/cm ³)	Shrinkage Rate (%)	Smoothness	Use As Paint	Note
1	2.5	4.5	14	×	○	Many Large Grains, Bad Sheet State Condition
5	3.8	4.9	17.3	○	○	
10	3.7	5.18	18.46	○	○	
15	3.7	5.22	18.5	○	○	
20	3.7	5.24	18.6	○	○	
25	3.7	5.25	18.58	○	○	
35	3.7	5.23	18.8	○	×	Paint Becomes Gel

34/45

FIG. 36

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	NiO (mol%)	MnO (mol%)	ZnO (mol%)	MgO (mol%)	CuO (wt%)	Bi ₂ O ₃ (wt%)	Note
6	68.7	21.035	10.162	0.103	—	—	—	5.00	5.00	
7	68.7	21.035	9.752	0.513	—	—	—	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With NiO
8	68.7	21.035	7.699	2.566	—	—	—	5.00	5.00	
9	68.7	21.035	5.133	5.133	—	—	—	5.00	5.00	
10	68.7	21.035	10.162	—	0.103	—	—	5.00	5.00	
11	68.7	21.035	9.752	—	0.513	—	—	5.00	5.00	
12	68.7	21.035	7.699	—	2.566	—	—	5.00	5.00	
13	68.7	21.035	5.133	—	5.133	—	—	5.00	5.00	
14	68.7	21.035	10.162	—	—	0.103	—	5.00	5.00	
15	68.7	21.035	9.752	—	—	0.513	—	5.00	5.00	
16	68.7	21.035	7.699	—	—	2.566	—	5.00	5.00	
17	68.7	21.035	5.133	—	—	5.133	—	5.00	5.00	
18	68.7	21.035	10.162	—	—	—	0.103	5.00	5.00	
19	68.7	21.035	9.752	—	—	—	0.513	5.00	5.00	
20	68.7	21.035	7.699	—	—	—	2.566	5.00	5.00	
21	68.7	21.035	5.133	—	—	—	5.133	5.00	5.00	

35/45

FIG.37

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	CuO (mol%)	Bi ₂ O ₃ (wt%)	CuO (wt%)	Note
22	68.7	21.035	9.752	0.513	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 5%
23	68.7	21.035	7.699	2.566	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 25%
24	68.7	21.035	5.133	5.133	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 50%
25	68.7	21.035	2.566	7.699	5.00	5.00	A Portion Of Co ₃ O ₄ Was Substituted With CuO By 75%

FIG.38

Sample No.	Calcining Temperature (°C)	Sintered Body Density (g/cm ³)	Shrinkage Rate (%)	μ (500MHz)	ϵ (1MHz)
22	1200	5.06	15.46	1.77	40
	1250	5.24	17.96	3.61	38
23	1200	5.01	16.00	1.70	43
	1250	5.24	17.62	2.66	42
24	1200	5.10	16.35	1.80	43
	1250	5.23	17.73	2.03	43
25	1200	5.12	16.46	1.84	45
	1250	—	—	—	—

FIG.39

Sampl No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	SrCO ₃ (mol%)	Bi ₂ O ₃ (wt%)	CuO (wt%)	Note
26	68.7	20.614	10.162	0.421	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 2%
27	68.7	20.194	10.162	0.841	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 4%
28	68.7	19.352	10.162	1.683	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 8%
29	68.7	17.669	10.162	3.366	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 16%
30	68.7	16.828	10.162	4.207	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 20%
31	68.7	15.776	10.162	5.259	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 25%
32	68.7	13.673	10.162	7.362	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 35%
33	68.7	10.517	10.162	10.517	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 50%
34	68.7	5.259	10.162	15.776	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 75%
35	68.7	0	10.162	21.035	5.00	5.00	A Portion Of BaCO ₃ Was Substituted With SrCO ₃ By 100%

37/45

FIG.40

Sample No.	Calcining Temperature (°C)	Sintered Body Density (g/cm³)	Shrinkage Rate (%)	μ' (500MHz)	μ'' (500MHz)
26	1300	5.23	17.04	2.00	0.034
27	1300	5.21	17.00	2.03	0.042
28	1300	5.17	17.00	2.05	0.051
29	1300	4.92	15.85	2.44	0.073
30	1250	4.83	15.38	3.80	0.137
31	1250	4.69	15.01	4.01	0.260
32	1250	3.76	9.74	3.70	0.190
33	1250	2.97	2.62	2.54	0.010
34	1250	2.99	0.85	2.12	0.010
35	1250	—	—	—	—

38/45

FIG.41

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	Glass A (wt%)	Glass B (wt%)	Note
36	68.7	21.04	10.27	—	5.00	Glass A: Zinc Borosilicate Glass
37	68.7	21.04	10.27	5.00	—	Glass B: Zinc Borosilicate Glass

FIG.42

	SiO ₂	B ₂ O ₃	ZnO	Al ₂ O ₃	MnO	CoO	Li ₂ O	Na ₂ O	MgO	K ₂ O	(wt%)
Glass A	10.38	44.55	35.65	2.13	—	—	—	7.07	0.19	0.04	
Glass B	17.4	10.4	51.5	—	3.50	4.2	13	—	—	—	

FIG.43

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	Bi ₂ O ₃ Based Glass (wt%)			Zinc Borosilicate Glass (wt%)	CuO (wt%)	Bi ₂ O ₃ (wt%)
				Sintering Aid A	Sintering Aid B	Sintering Aid C			
38	68.7	21.035	10.265	3.00	—	—	—	—	—
39	68.7	21.035	10.265	5.00	—	—	—	—	—
40	68.7	21.035	10.265	7.00	—	—	—	—	—
41	68.7	21.035	10.265	9.00	—	—	—	—	—
42	68.7	21.035	10.265	—	3.00	—	—	—	—
43	68.7	21.035	10.265	—	5.00	—	—	—	—
44	68.7	21.035	10.265	—	7.00	—	—	—	—
45	68.7	21.035	10.265	—	—	3.00	—	—	—
46	68.7	21.035	10.265	—	—	5.00	—	—	—
47	68.7	21.035	10.265	—	—	7.00	—	—	—
48	68.7	21.035	10.265	—	—	—	3.00	—	—
49	68.7	21.035	10.265	—	—	—	5.00	—	—
50	68.7	21.035	10.265	—	—	—	7.00	—	—
51	68.7	21.035	10.265	—	—	—	—	3.00	—
52	68.7	21.035	10.265	—	—	—	—	5.00	—
53	68.7	21.035	10.265	—	—	—	—	7.00	—
54	68.7	21.035	10.265	—	—	—	—	—	5.00
55	68.7	21.035	10.265	—	—	—	—	—	10.00
56	68.7	21.035	10.265	—	—	—	—	5.00	5.00

10/09075

40/45

FIG.44

		Bi_2O_3	B_2O_3	ZnO	SiO_2	Al_2O_3	Na_2O	MgO	K_2O	(wt%)
Bi_2O_3 Based Glass	Sintering Aid A	83.83	13.75	—	1.94	—	—	—	—	
	Sintering Aid B	49.51	19.68	27.51	2.4	0.12	—	—	—	
	Sintering Aid C	39.89	19.57	37.3	2.32	0.16	—	—	—	
Zinc Borosilicate Glass		—	44.55	35.65	10.38	2.13	7.07	0.19	0.04	

10/009075

41/45

FIG.45

Sample No.	Shrinkage Rate (%)	Sintered Body Density (g/cm ³)	Additive					Calcinning Temperature (°C)	Sintering Temperature (°C)		
			Bi ₂ O ₃ Based Glass			Zinc Borosilicate Glass	CuO				
			Sintering Aid A	Sintering Aid B	Sintering Aid C						
38	14.77	4.50	3wt%	—	—	—	—	1300	930		
39	15.96	4.74	5wt%	—	—	—	—	1300	930		
40	16.42	4.84	7wt%	—	—	—	—	1300	930		
41	16.50	4.88	9wt%	—	—	—	—	1300	930		
42	11.89	4.22	—	3wt%	—	—	—	1300	930		
43	13.39	4.42	—	5wt%	—	—	—	1300	930		
44	14.04	4.53	—	7wt%	—	—	—	1300	930		
45	11.15	4.18	—	—	3wt%	—	—	1300	930		
46	12.66	4.37	—	—	5wt%	—	—	1300	930		
47	13.38	4.39	—	—	7wt%	—	—	1300	930		
48	12.30	4.49	—	—	—	3wt%	—	1300	950		
49	13.10	4.40	—	—	—	5wt%	—	1300	950		
50	14.12	4.35	—	—	—	7wt%	—	1300	950		

FIG.46

Sample No.	Relative Resistivity (MΩ · cm)	Bi ₂ O ₃ Based Glass (wt%)			CuO (wt%)	Bi ₂ O ₃ (wt%)
		Sintering Aid A	Sintering Aid B	Sintering Aid C		
38	360	3.00	—	—	—	—
39	770	5.00	—	—	—	—
40	940	7.00	—	—	—	—
41	840	9.00	—	—	—	—
42	75	—	3.00	—	—	—
43	310	—	5.00	—	—	—
44	910	—	7.00	—	—	—
45	51	—	—	3.00	—	—
46	140	—	—	5.00	—	—
47	310	—	—	7.00	—	—
51	51	—	—	—	3.00	—
52	37	—	—	—	5.00	—
53	18	—	—	—	7.00	—
54	21	—	—	—	—	5.00
55	18	—	—	—	—	10.00
56	24	—	—	—	5.00	5.00

FIG.47

Sample No.	Fe ₂ O ₃ (mol%)	BaCO ₃ (mol%)	Co ₃ O ₄ (mol%)	Additive			Note
				Bi ₂ O ₃ Based Glass (wt%)	CuO (wt%)	Zinc Borosilicate Glass (wt%)	
38	68.7	21.035	10.265	3.00	—	—	Sintering Aid A
39	68.7	21.035	10.265	5.00	—	—	
40	68.7	21.035	10.265	7.00	—	—	
57	68.7	21.035	10.265	3.00	3.00	—	
58	68.7	21.035	10.265	5.00	5.00	—	
59	68.7	21.035	10.265	7.00	7.00	—	
42	68.7	21.035	10.265	3.00	—	—	Sintering Aid B
43	68.7	21.035	10.265	5.00	—	—	
44	68.7	21.035	10.265	7.00	—	—	
60	68.7	21.035	10.265	3.00	3.00	—	
61	68.7	21.035	10.265	5.00	5.00	—	
62	68.7	21.035	10.265	7.00	7.00	—	
45	68.7	21.035	10.265	3.00	—	—	Sintering Aid C
46	68.7	21.035	10.265	5.00	—	—	
47	68.7	21.035	10.265	7.00	—	—	
63	68.7	21.035	10.265	3.00	3.00	—	
64	68.7	21.035	10.265	5.00	5.00	—	
65	68.7	21.035	10.265	7.00	7.00	—	
48	68.7	21.035	10.265	—	—	3.00	Comparative Example
49	68.7	21.035	10.265	—	—	5.00	
50	68.7	21.035	10.265	—	—	7.00	

44/45

FIG.48

Sample No.	Shrinkage Rate(%)	Sintered Body Density (g/cm ³)	μ' (500MHz)	μ'' (500MHz)	Additive			
					CuO (wt%)	Sintering Aid A (wt%)	Sintering Aid B (wt%)	Sintering Aid C (wt%)
38	14.77	4.50	2.67	0.05	—	3.0	—	—
39	15.96	4.74	2.52	0.04	—	5.0	—	—
40	16.42	4.84	2.25	0.03	—	7.0	—	—
57	15.92	4.77	3.12	0.08	3.0	3.0	—	—
58	16.77	4.92	3.08	0.08	5.0	5.0	—	—
59	16.69	4.91	1.92	0.03	7.0	7.0	—	—
42	11.89	4.22	3.37	0.03	—	—	3.0	—
43	13.39	4.42	3.60	0.04	—	—	5.0	—
44	14.04	4.53	3.37	0.04	—	—	7.0	—
60	14.12	4.52	3.47	0.15	3.0	—	3.0	—
61	15.81	4.79	3.80	0.39	5.0	—	5.0	—
62	16.31	4.87	2.72	0.17	7.0	—	7.0	—
45	11.15	4.18	3.46	0.02	—	—	—	3.0
46	12.66	4.37	3.81	0.09	—	—	—	5.0
47	13.38	4.39	3.43	0.07	—	—	—	7.0
63	13.50	4.46	3.55	0.18	3.0	—	—	3.0
64	15.23	4.70	3.88	0.42	5.0	—	—	5.0
65	15.54	4.73	2.88	0.223	7.0	—	—	7.0

FIG.49

Sample No.	Permittivity ϵ	Bi ₂ O ₃ Based Glass (wt%)			CuO (wt%)	Bi ₂ O ₃ (wt%)
		Sintering Aid A	Sintering Aid B	Sintering Aid C		
38	27	3.0	—	—	—	—
39	30	5.0	—	—	—	—
40	28	7.0	—	—	—	—
57	31	3.0	—	—	3.0	—
58	31	5.0	—	—	5.0	—
59	30	7.0	—	—	7.0	—
42	22	—	3.0	—	—	—
43	25	—	5.0	—	—	—
44	23	—	7.0	—	—	—
60	26	—	3.0	—	3.0	—
61	27	—	5.0	—	5.0	—
62	27	—	7.0	—	7.0	—
45	21	—	—	3.0	—	—
46	24	—	—	5.0	—	—
47	24	—	—	7.0	—	—
63	25	—	—	3.0	3.0	—
64	26	—	—	5.0	5.0	—
65	26	—	—	7.0	7.0	—
56	40	—	—	—	5.0	5.0